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EX-FEVER: A Dataset for Multi-hop Explainable Fact Verification

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Introduction

- Fact verification involves predicting the veracity of a claim based on retrieved evidence.
- A typical fact-checking system consists of two main stages: evidence retrieval and veracity prediction.
- While significant progress has been made in this field, current research faces challenges in dealing with complex, **multi-hop** reasoning and **providing explanations** for verdicts.
- To address these limitations, we introduce a new dataset for multi-hop explainable fact verification.
- This dataset aims to promote the development of more advanced fact-checking systems capable of handling complex claims and providing transparent explanations for their verdicts.

EX-FEVER Dataset

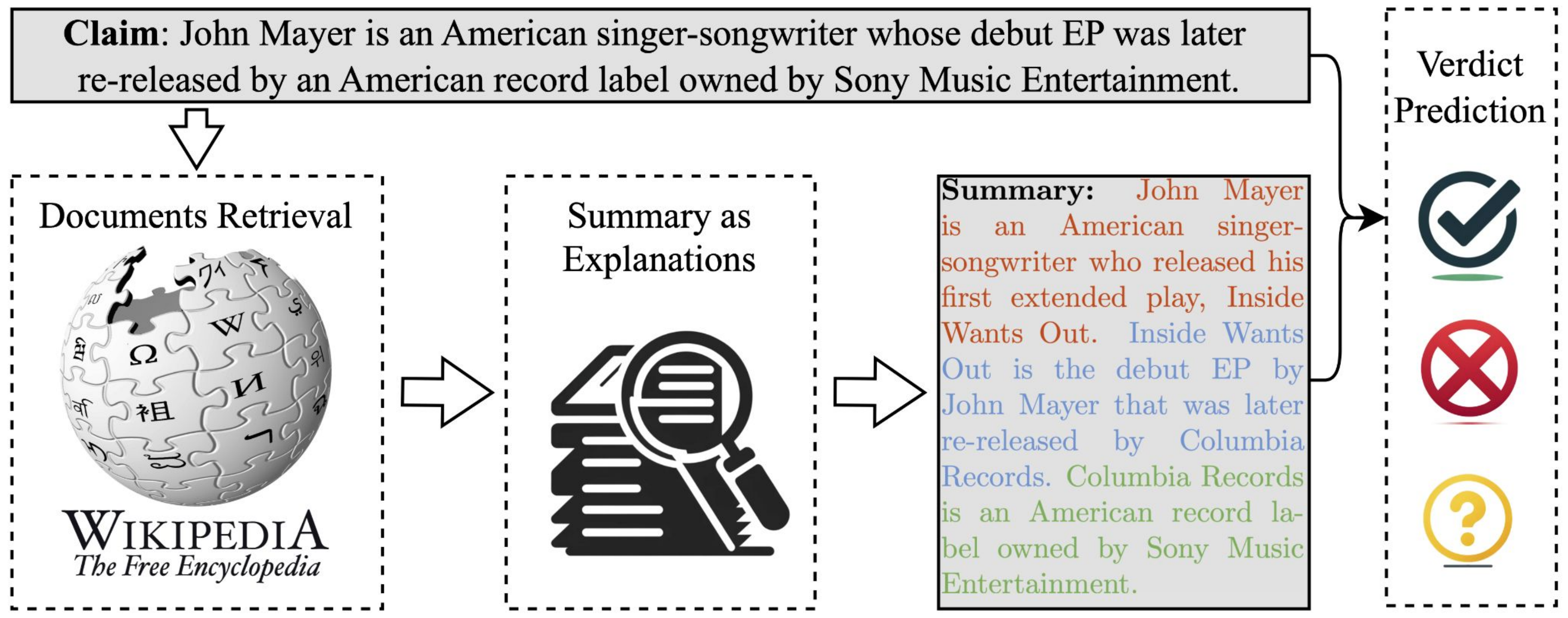
Claim	John Mayer is an American singer-songwriter whose debut EP was later re-released by an American record label owned by Sony Music Entertainment.	
Golden Explanation	John Mayer is an American singer-songwriter who released his first extended play, Inside Wants Out. Inside Wants Out is the debut EP by John Mayer that was later re-released by Columbia Records. Columbia Records is an American record label owned by Sony Music Entertainment.	
Golden Document	John Mayer, Inside Wants Out, Columbia Records	**Label** **SUPPORT**

A sample in the proposed dataset EX-FEVER. The textual explanation in different colors refers to the information in different documents.

Table1: Data Statistics with different number of hops and different label classes. The average claim length and explanation length in word level are reported.

Hops	SUP	REF	NEI	Claim	EXP
2 Hops	11053	11059	11412	21.63	28.39
3 Hops	9337	9463	8941	30.69	43.45
Total	20390	20522	20353	25.73	35.21

Baseline System



Claim: John Mayer is an American singer-songwriter whose debut EP was later re-released by an American record label owned by Sony Music Entertainment.

Summary: John Mayer is an American singer-songwriter who released his first extended play, Inside Wants Out. Inside Wants Out is the debut EP by John Mayer that was later re-released by Columbia Records. Columbia Records is an American record label owned by Sony Music Entertainment.

The baseline system comprises three stages: document retrieval, summary generation as explanations, and verdict prediction. The system produces two main outputs: a veracity label and a summary that serves as an explanation for the prediction.

Experimental results

Table2: Retrieve Model Performance Comparison

Model	EM	Hit@6	Hit@12	Hit@30
MDR	43.3	55.00	60.90	68.60
BERT-based	32.4	66.12	70.28	73.98

Table3: Generated Summary Metrics Comparison

Model	Length	rouge1	rouge2	rougeL	rougeLsum
MDR	54.79	54.88	41.34	49.42	53.02
BERT-based	46.05	46.88	32.80	35.52	44.41
Explanation from ChatGPT					
GPT-0example	58.05	52.28	33.74	48.13	49.89
GPT-3example	48.56	59.98	42.85	57.66	55.61

Table4: Verify Model Comparison. The accuracy (%) of each model is reported

Model	Val	Test	Test On Golden	Train With Golden
Gear@BERT-based	54.96	54.71	53.08	61.05
Gear@MDR	59.68	58.89	53.98	-
BERT@BERT-based	68.07	67.65	76.69	99.29
BERT@MDR	73.86	73.34	76.89	-
HOVER@MDR	46.58	45.41	33.79	-

Prompt-based approach

We use LLMs in the fact checking task in two directions:

1. Directly using **LLMs as an actor**
2. Using **LLMs as a planner**

We both evaluate the verdict accuracy and the ability of LLMs to generate explanations.

Experimental results

Table5: Use LLM as an actor or a planner. The accuracy (%) of each model is reported.

Type	Model	Close	Open	Gold
Actor	ClaimOnly	45.78	-	-
	w/o exp	-	-	47.91
	w/ exp	-	-	47.92
	1 shot	-	-	47.91
	3 shots	-	-	58.69
Planner	ProgramFc	47.30	51.70	64.90

Discussion & Conclusion

- **Dataset Introduction:** We present a publicly accessible fact-checking dataset, EX-FEVER, with over 60,000 multi-hop claims and detailed annotations for understanding veracity assessments.
- **System Design:** Our comprehensive system includes retrieval, summarization for explanation, and verification stages, highlighting the dataset's significance.
- **LLM Investigations:** Preliminary studies with the GPT-3.5-turbo model show that using LLMs as planners yields better performance than as actors, particularly in generating explanations.
- **Improvement Potential:** Despite the capabilities of LLMs, there is substantial room for enhancement in the fact-checking process.
- **Benchmarking Value:** EX-FEVER serves as a crucial benchmark for advancing explainable multi-hop fact-checking, aiding in reliability and informed decision-making across various fields.